



**Seminar Hora Informaticae**

**Institute of Computer Science, Prague**

Tuesday, October 24, 2023, 14.00 – 15.30 (2 - 3:30 PM) CEST

Meeting room 318, Address: Pod Vodárenskou věží 2, Prague 8

ZOOM Meeting ID: 954 7823 4977 , Passcode: 712564

ZOOM: <https://cesnet.zoom.us/j/95478234977?pwd=dXoyekFHbDJ0MkNrTjVVS3F2STZqUT09>



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**Věra Kůrková (Institute of Computer Science, CAS):**

### **Approximation of classifiers of large data sets by deep ReLU networks**

Rapid development of experimental research and successful practical applications of deep networks inspires many theoretical questions. In this talk, we will focus on approximation capabilities of deep ReLU networks, which are one of the most popular network architectures. We will explore the effect of network depths and numbers of their parameters on behavior of approximation errors. To obtain probabilistic bounds on approximation errors, we will employ concepts from statistical learning theory (growth function, VC dimension) and high-dimensional geometry (concentration of measure). We will address the dilemma between approximation accuracy and consistency in learning from random samples of data. We will discuss limitations of approximation capabilities of networks of finite VC dimension in distribution agnostic settings.

References:

V.Kůrková: Approximation of binary-valued functions by networks of finite VC dimension. In ICANN 2023, Eds L. Iliadis et al. (pp. 483–490). Springer, 2023. DOI 10.1007/978-3-031-44207-0\_40

V.Kůrková, M. Sanguineti: Approximation of classifiers by deep perceptron networks, Neural Networks 165: 654–661, 2023. DOI 10.1016/j.neunet.2023.06.004

V. Kůrková, M. Sanguineti: Correlations of random classifiers on large data sets, Softcomputing 25: 12641-12648, 2021. <https://dx.doi.org/10.1007/s00500-021-05938-4>

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**Věra Kůrková** is a senior scientist from the Department of Machine Learning, Institute of Computer Science of the Czech Academy of Sciences. She received PhD. in mathematics from the Charles University, Prague, and DrSc. (Prof.) in theoretical computer science from the Czech Academy of Sciences. She has been affiliated with the Institute of Computer Science since 1990 (in 2002-2008 she was the Head of the Department of Theoretical Computer Science). In 2010, she received the Bolzano Medal for her contribution to mathematical sciences from the Czech Academy of Sciences.

Her main research interests are mathematical theory of neurocomputing and machine learning. Her work includes analysis of capabilities and limitations of shallow and deep networks, dependence of network complexity on increasing dimensionality of computational tasks, connections between theory of inverse problems and generalization in machine learning, and nonlinear approximation theory.

She has been a member of the Board of the European Neural Network Society since 2008 (in 2017-2019 she was its president) and of the editorial boards of the journals Neural Networks, Neural Processing Letters, and Applied and Computational Harmonic Analysis. She has been involved in organization of conferences ICANN and EANN in various roles (general chair, co-chair, or honorary chair).

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**HORA INFORMATICAЕ** (meaning: TIME FOR INFORMATICS) is a broad-spectrum scientific seminar devoted to all core areas of computer science and its interdisciplinary interfaces with other sciences and applied domains. Original contributions addressing classical and emerging topics are welcome. Founded by Jiří Wiedermann, the seminar is running since 1994 at the Institute of Computer Science of the Czech Academy of Sciences in Prague.

<https://www.cs.cas.cz/horainf>